REMARKS

Applicant has amended the application as set forth above. Claims 1-4 and 9-19 have been amended. New Claims 20-25 have been added. Upon the entry of the amendments, Claims 1-25 are pending in this application. No new matter is added by the amendments as discussed below. Applicant respectfully requests the entry of the amendments and reconsideration of the application in view of the amendments and the remarks set forth below.

Discussion of Amendments

The amendments to the specification at Paragraph [0026] are supported by the PCT Publication No. WO 01/87464 A1 at page 8, lines 20-24. The PCT publication is incorporated in the specification by reference. *See* Paragraph [0001] of the present specification.

The amendments to Claim 1-4 and 9-14 are made to clarify the invention. In Claims 1, 2 and 14-19, the language of "at least one movable ion" is supported by, among other statements, statements in paragraph [0020] of the specification. Support for the language of "at least one block of $[O–(CH_2)_x]_y$ units and at least one non-movable ionic moiety" can be found at, among other places, paragraph [0014] of the specification. The limitation that x is an integer equal to or greater than two is supported by, among others, the examples of polyethylene oxide and polypropylene oxide at paragraph [0014]. The limitation that y is an integer equal to or greater than two is supported by, among others, the examples of polyethylene oxide and polypropylene oxide at paragraph [0014].

In Claim 2, the limitations of at least one of a hole-injecting layer and an electron-injecting layer is supported by originally filed Claims 16-19. Amendments to Claims 3, 4, 9, 11, 13 are to correct the terms for proper antecedent basis in view of the amendments to Claim 2. Amendments to Claims 10 and 12 are supported by, among others, paragraphs [0015] and [0017] of the specification.

As such, the Amendments are fully supported by the application as originally filed. Thus, no new matter is added by the Amendments. Applicant respectfully requests the entry of the amendments.

Foreign Priority Document

A certified copy of Korean Patent Application No. 2000/16456 is accompanied herewith. Applicant respectfully requests that acknowledgement of the receipt of the priority document be made in the next Office Action or communication.

Discussion of Objection to the Specification

The Examiner objected to the specification as the description of Figure 2 in Paragraph [0026] includes three sets of parentheses that are not filled. Applicant has amended the specification as set forth above to fill the parentheses with the symbols used in Figure 2.

Discussion of Rejection Under 35 U.S.C. § 102

Claims 1-5, 8-9, 12 and 18 have been rejected under 35 U.S.C. § 102 (b) as being anticipated by Shi et al. (U.S. Patent No. 5,817,431). Also, Claims 1-6, 8-9 have been rejected under 35 U.S.C. § 102 (b) as being anticipated by WO 97/40648. Applicants respectfully disagree.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *See, e.g., Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Each of these references does not disclose every element of the pending claims.

Independent Claims 1 and 2 recite, among other features, the at least one of the hole-injecting and electron-injecting layers comprises a polymeric compound and a movable ion. The polymeric compound of Claims 1 and 2 has at least one block of $[O–(CH_2)_x]_y$ units and at least one non-movable ionic moiety, wherein x is an integer equal to or greater than two, wherein y is an integer equal to or greater than two. Independent Claim 18 recites that the electron-injecting layer comprising a polymeric compound and a movable cation. The polymeric compound of Claim 18 has at least one block of $[O–(CH_2)_x]_y$ units and at least one non-movable anionic moiety, wherein x is an integer equal to or greater than two, wherein y is an integer equal to or greater than two.

Shi discloses in Figure 1 an organic electroluminescent device (10), which includes an electron-injecting layer (24). Shi teaches use of an organometallic complex of Formula I (*see* column 3) in the electron-injecting layer (24). However, Shi does not teach or disclose <u>any</u>

polymeric compounds for use in the electron-injecting layer or in a hole-injecting layer. The metal ion in the organometallic complex does not teach a movable ion used in the claimed hole-injecting or electron injecting layer. As such, Shi does not disclose all of the claimed elements.

WO 97/40648 teaches an organic electroluminescent device including an ionic layer. WO 97/40648 teaches polymers of formula I or II (page 8) for use in the ionic layer. However, this reference does not disclose or teach any polymeric compound having at least one block of $[O-(CH_2)_x]_y$ units.

Nor does WO 97/40648 teach or disclose the use of such a polymeric compound in a hole-injecting or electron-injecting layer. In WO 97/40648, the polymers of formula I or II are used in light emitting or emissive layers: either in a single emissive layer (4 of Figure 1) or double emissive layers (14 and 15 of Figure 1). Both of the ionic layer 15 and additional layer 14 are emissive layers, not a hole-injecting or electron-injecting layer. The statement of WO 97/40648 at page 6, line 30 that the ionic and additional layers have substantially identical "fluorescence (light-emission) spectra" makes clear that its ionic and additional layers are emissive layer, not a separate layer for hole or carrier injection.

At least for the reasons discussed above, each of Claims 1, 2 and 18 is not anticipated by Shi or WO 97/40648. In other words, all of the elements of each claim are not disclosed by the reference individually. Accordingly, Claims 3-13 depending from Claim 2 are not anticipated by these references. In light of these facts, Applicants respectfully request the withdrawal of this anticipation rejection.

Discussion of Rejection Under 35 U.S.C. § 103

Shi and Pei do not establish a *prima facie* case of obviousness against Claims 1-8

Claims 1-8 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over Shi in view of Pei (U.S. Patent No. 5,682,043.) Applicants respectfully submit that Shi and Pei do not establish a *prima facie* case of obviousness as discussed below.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *See*

M.P.E.P. §2143.

Independent Claims 1 and 2 recite that, among other features, the at least one of the hole-injecting and electron-injecting layers comprises a polymeric compound and a movable ion. The polymeric compound has at least one block of $[O–(CH_2)_x]_y$ units and at least one non-movable ionic moiety, wherein x is an integer equal to or greater than two, wherein y is an integer equal to or greater than two. Claims 3-8 depending from Claim 2 incorporate these limitations of Claim 2.

As discussed above in conjunction with the discussion of rejection under 35 U.S.C. § 102, Shi neither teaches any polymeric compounds nor a movable ion for use in a hole- or electron-injecting layer. Pei discloses electrochemical light emitting devices which use a composite material of polymeric semiconductors and ionic species. Pei teaches poly(ethylene oxide) and poly(propylene oxide) as conductive polymers at column 8, lines 62-63. However, these polymers differ from the polymeric compounds recited in the present claims as they do not have any non-movable ionic moieties.

Further, Pei does not teach use of such polymeric semiconductors and ionic species in a hole-injecting or electron-injecting layer. In all of his Examples 1-5, Pei's devices have only one layer between two electrodes, and therefore that layer must be an emissive layer. Pei does not disclose or teach any separate layer for hole or electron injection at all. Pei's polymeric semiconductor and ionic species are used in that single emissive layer. Therefore, Pei's use of the polymeric semiconductor and ionic species does not teach or suggest use of the claimed polymeric compound in a hole-injecting or electron-injecting layer. Rather, Pei's use of the polymeric semiconductor and ionic species in the emissive layer only teaches away formation of a separate hole-injecting or electron-injecting layer comprising a polymeric compound and ionic species therein.

For the reasons stated above, there is no teaching or suggestion to combine the two references, particularly, to use the composite material of Pei in a hole-injecting or electron-injecting layer of Shi. Thus, no combination of the references is justified. Further, even if combined, the two references in combination do not teach all of the claimed limitations, particularly, among other limitations, the polymeric compound having at least one block of $[O–(CH_2)_x]_y$ units and at least one non-movable ionic moiety. As such, no *prima facie* case of obviousness is established.

Schoo does not establish a *prima facie* case of obviousness against Claims 1-6, 8-10 and 14-19

The Examiner rejected Claims 1-6, 8-10 and 14-19 under 35 U.S.C. § 103 (a) as being unpatentable over Schoo (U.S. Patent No. 6,326,091.) Applicants respectfully submit that Schoo does not establish a *prima facie* case of obviousness.

Independent Claims 1 and 2 recite, among other features, the at least one of the hole-injecting and electron-injecting layers comprising a polymeric compound and a movable ion. The polymeric compound having at least one block of $[O–(CH_2)_x]_y$ units and at least one non-movable ionic moiety, wherein x is an integer equal to or greater than two, wherein y is an integer equal to or greater than two. Claims 3-6 and 8-10 depend from Claim 2, and accordingly incorporate these recitations therein. Independent Claims 14-19 also recite, among other features, a polymeric compound having at least one block of $[O–(CH_2)_x]_y$ units and at least one non-movable ionic moiety, wherein x is an integer equal to or greater than two, wherein y is an integer equal to or greater than two.

Schoo is essentially the same as WO 97/40648, discussed above in connection with the rejection under 35 U.S.C. § 102, as they have a common priority application, The Netherlands Application No.1002944, filed April 25, 1996. Schoo teaches an organic electroluminescent device with an ionic layer, containing polymers of formula IA, IB or II (columns 6-7). However, Schoo does not disclose or teach any polymeric compounds having at least one block of $[O–(CH_2)_x]_y$ units and the non-movable ionic moiety.

Further, Schoo does not teach use of such a polymeric compound in a hole-injecting or electron-injecting layer. In Schoo, the polymers of formula IA, IB or II are used in light emitting or emissive layers only: either in a single emissive layer (4 of Figure 1) or double emissive layers (14 and 15 of Figure 1). Both of the ionic layer 15 and additional layer 14 are emissive layers as Schoo states at page 6, line 30 that the ionic and additional layers have substantially identical fluorescence spectra, which means they emit light. Schoo does not disclose or teach any other constructions using a hole-injecting or electron-injecting layer other than the emissive layer(s). As such, Schoo does not teach all of the claimed elements and cannot establish a *prima facie* case of obviousness.

Furthermore, Schoo's use of the polymers of formula IA, IB or II only in an emissive layer(s) would teach away formation of a separate hole-injecting or electron-injecting layer comprising such a polymer therein. Therefore, Schoo cannot be properly modified to add a hole-

injecting or electron-injecting layer. Nor can it be properly modified to use the polymers of formula IA, IB or II in such a hole-injecting or electron-injecting layer other than the emissive layer. For this additional reason, no *prima facie* obviousness would be established with Schoo.

Schoo and Pei do not establish a *prima facie* case of obviousness against Claims 10-11 and 13

Claims 10-11 and 13 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over Schoo in view of Pei. Applicant respectfully submits that Schoo and Pei do not establish a *prima facie* case of obviousness against Claims 10-11 and 13.

Claims 10-11 and 13 depend from Claim 2 and accordingly incorporate all of the limitations of Claim 2. As noted above, Claim 2 recite, among other features, a polymeric compound having at least one block of $[O–(CH_2)_x]_y$ units and at least one non-movable ionic moiety, wherein x is an integer equal to or greater than two, wherein y is an integer equal to or greater than two. Claims 11 and 13 further define the polymeric compound by its structure.

As discussed immediately above, Schoo does not disclose or teach any polymeric compound having at least one block of $[O–(CH_2)_x]_y$ units and the non-movable ionic moiety. As the Examiner correctly indicates at page 6, the last paragraph of the Office Action, Schoo does not disclose or teach the polymers of Claims 11 and 13. Further, Schoo does not teach use of such polymeric compound in a hole-injecting or electron-injecting layer. Rather, Schoo teaches away the formation of a hole-injecting or electron-injecting layer containing the claimed polymeric compound.

Pei teaches the mixture of polymeric semiconductors and ionic species. Although Pei teaches poly(ethylene oxide) and poly(propylene oxide) as conductive polymers at column 8, lines 62-63, these polymers differ from the polymeric compounds recited in the present claims as they do not have any non-movable ionic moiety. Further, Pei does not teach use of such polymeric semiconductors and ionic species in a hole-injecting or electron-injecting layer. In Pei, the polymeric semiconductor and ionic species are used in a light emitting layer, not in a carrier injection layer as they are used in a single layer located between two electrodes in all of his Examples 1-5. In fact, Pei does not disclose or teach any of hole-injecting or electron-injecting layer separate from the light emitting layer.

As such Pei does not remedy the deficiencies of Schoo at all. Thus, the combination of Schoo and Pei does not teach or suggest all limitations of Claim 2, much less of Claims 10-11

and 13. Applicants respectfully submit that Schoo and Pei do not establish a *prima facie* case of obviousness.

In view of the foregoing, the presently pending claims are patentable over the references. Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103(a).

CONCLUSION

In view of Applicant's amendments to the claims and the foregoing remarks, Applicant respectfully submits that the present application is in condition for allowance. Should the Examiner have any remaining concerns, which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 1/28/04

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